

CLAIMS

1. A process for making high purity fatty acid lower alkyl esters, comprising the steps of:

- (a) converting a source of fatty acids to a product mixture comprising fatty acid lower alkyl esters and by-products;
- (b) water-washing the product mixture at an elevated temperature, preferably from about 70°F (21°C) to about 200°F (93°C), and an elevated pressure, preferably from about 760 mm Hg to about 1000 mm Hg, to remove at least a portion of the by-products from product mixture; and
- (c) fractionally distilling the water-washed product mixture to obtain high purity fatty acid lower alkyl esters; and

wherein at least a portion of the fatty acids have at least 16 carbon atoms, preferably from about 20 to about 24 carbon atoms; and preferably wherein the water-washed product mixture comprises no more than about 1000 ppm soap, no more than about 1000 ppm glycerides, and no more than about 100 ppm basic catalyst; and further wherein the high purity fatty acid lower alkyl esters have an acid value of no greater than about 1.0.

2. A process according to claim 1, further comprising the step of collecting at least one fraction of high purity fatty acid lower alkyl esters during the step of fractionally distilling, wherein preferably the high purity fatty acid lower alkyl esters have an acid value of less than about 0.5, and wherein preferably the fatty acid lower alkyl esters comprise behenic methyl ester, more preferably wherein the color of the behenic acid methyl ester is about 0.5 or less Lovibond yellow.

3. A process according to claim 1 or 2, wherein the step of fractionally distilling is performed at a temperature of from about 325°F (163°C) to about 475°F (246°C) and in the absence of a base.

4. A process according to claim 1 or 2, wherein the step of fractionally distilling is performed at a temperature of from about 475°F (246°C) to about 530°F (277°C) and in the presence of a base, and preferably wherein step (c) comprises the steps of:

- (1) fractionally distilling the water-washed product mixture to obtain a first portion of the fatty acid lower alkyl esters;
 - (2) neutralizing the remaining water-washed product mixture to an acid value of no more than about 0.2; and
 - (3) further fractionally distilling the neutralized water-washed product mixture to obtain a second portion of the fatty acid lower alkyl esters.
5. A process according to claim 1, 2, 3, or 4, further comprising the step of hardening the fatty acid lower alkyl ester.
6. A process according to claim 1, wherein the fatty acid lower alkyl esters comprise C18 methyl esters, C20 methyl esters and C22 methyl esters; and the process step (c) comprises the steps of collecting a first fraction comprising C18 methyl esters; collecting a second fraction comprising C18 methyl esters, C20 methyl esters and C22 methyl esters; and collecting a third fraction comprising C22 methyl esters, preferably from about 86% to about 95%, by weight.
7. A process according to claim 6 wherein the fatty acid source is behenic acid glycerol ester and the fatty acid lower alkyl esters comprise behenic acid methyl ester, and preferably wherein the color of the behenic acid methyl ester is about 0.5 or less Lovibond yellow.
8. High purity fatty acid lower alkyl esters made by the process of claim 1, 2, 3, 4, 5, 6, or 7.

9. An alkyl ester product made by a process comprising the steps of:
- (a) converting a source of fatty acids to a product mixture comprising fatty acid lower alkyl esters and by-products;
 - (b) water-washing the product mixture at an elevated temperature and an elevated pressure to remove at least a portion of the by-products from product mixture; and
 - (c) fractionally distilling the water-washed product mixture to obtain high purity fatty acid lower alkyl esters; and
 - (d) making an alkyl ester product with the high purity fatty acid lower alkyl esters;

wherein at least a portion of the fatty acids have at least 16 carbon atoms, preferably from about 20 to about 24 carbon atoms; and further wherein the high purity fatty acid lower alkyl esters have an acid value of no greater than about 1.0.

10. A process for preparing fatty acid polyol polyesters comprising the steps of:
- (a) preparing high purity fatty acid lower alkyl esters by
 - (1) reacting a fatty acid glycerol ester, preferably behenic acid glycerol ester, with a lower alkyl alcohol, preferably methanol, in the presence of a catalyst to produce a product mixture of fatty acid lower alkyl ester, fatty acid glycerol ester and glycerol;
 - (2) separating the product mixture into a glycerol-containing phase and a fatty acid lower alkyl ester-containing phase;
 - (3) water-washing the fatty acid lower alkyl ester-containing phase at an elevated temperature and elevated pressure to remove at least a portion of by-products from the fatty acid lower alkyl ester-containing phase;
 - (4) fractionally distilling the resulting water-washed fatty acid lower alkyl esters; and
 - (5) collecting at least one fraction of highly purified fatty acid lower alkyl ester; and
 - (b) transesterifying the highly purified fatty acid lower alkyl ester of the collected fraction with a polyol to obtain a fatty acid polyol polyester; and

wherein the high purity fatty acid lower alkyl esters have an acid value of less than about 1.0, and wherein preferably the polyol polyester has a triglyceride level of less than about 0.5%, by weight.

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